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GENTLEMEN,—The past season has not been very eventful in Ontario in matters relating to insect life. No unusual armies of insect enemies have devastated our crops, and our farmers and fruit-growers, in spite of the few perennial foes, which are always more or less troublesome, have realized a bountiful harvest.

Early in the season cut-worms were very numerous in the neighborhood of London, more abundant than I ever remember seeing them before. They destroyed innumerable cabbage plants and other herbaceous plants and flowers; among the latter pansies seemed to possess great attraction for them. I saw many fine plants of this flower of the previous year's growth eaten close to the ground, both leaves and stalks, and from about the roots of a single plant found in several instances from thirty to fifty of the nearly full grown larvæ. Fortunately their period of activity does not last long, and before the end of June most of them were quietly sleeping in the chrysalis state.

The question of insectivorous birds, and their influence on the insect world about us, is attracting much attention, and the more the subject is discussed the more evident it becomes that very little indeed is *known* in reference to it; that our ideas as to what should guide us are largely inherited, or otherwise based on sentiment, rather than resting upon well ascertained facts. I am well aware that to plead in favor of the birds is a popular course to follow; but the true student of nature is ever seeking after truth, and whether the facts he discovers are in accord with long cherished opinions and popular fancies, or are directly opposed to them, are questions of little moment. The facts, whatever they may be, are what we want.

Insectivorous birds may be conveniently divided into three classes: First, those which take their food entirely on the wing; second, those which feed partly on the wing and partly from trees and shrubs, and on the ground; and third, those which take no food on the wing, but feed

entirely either on the ground or from trees or shrubs. In the first class, besides some rare birds which we do not need to mention here, the following are found common in most parts of our Province: the swallows, *Hirundinidæ*; kingbird, *Tyrannus Carolinensis*; pewee, *Sayornis fuscus*, and nighthawk, *Chordeiles popetue*. The food of these birds consists chiefly of flies, a large proportion of which cannot be said to be either noxious or beneficial; many of them in the earlier stages of their existence live in the water, where they devour decaying vegetation or feast on the lower and simpler forms of animal and vegetable life. The larvæ of many others are scavengers, devouring decaying or putrescent animal and vegetable matter, and hence well deserve to be classed with beneficial insects. In the same class of friendly species will rank a considerable number of others which are parasitic on the bodies of caterpillars, also the rapacious species who sustain themselves by devouring the weaker and less vigorous of their race. A few rare exceptions, of which the wheat midge and Hessian fly may be noted as examples, are very injurious to field crops, while the mosquito and black fly are universally branded as enemies to the human race. These birds also devour a few butterflies and moths, but these, with few exceptions, are harmless. The question, then, to what extent these purely insectivorous birds are beneficial to the farmer or fruit grower, reasonably admits of much difference of opinion, for while they do devour a few of our tormentors, they probably destroy a much larger number of beneficial insects, the main bulk of their food, however, consisting of harmless species. Doubtless they serve a purpose in maintaining a proper balance among the insect hosts, and between animal and vegetable life, but that their service in these departments is so all-important as some would urge admits of grave doubt.

The birds of the second division, namely, those who take their food partly on the wing and partly from trees and shrubs, or on the ground, are not entirely insectivorous. The remarks just made in reference to the first class will apply also to this as far as their food is taken on the wing, but on trees or shrubs, or on the ground, they consume insects of entirely different classes, chiefly beetles and the caterpillars of moths and butterflies. The beetles admit of a similar division to that of the flies already noticed; the larger number are harmless, a large proportion of the remainder are beneficial, and a few are injurious. Most of the caterpillars of moths and butterflies are harmless, feeding in limited numbers on a great diversity of shrubs and trees of little or no economic importance.

A few may be said to be beneficial, in consequence of their feeding on troublesome weeds, such as thistles, etc., while a few others are decidedly injurious. Among the common birds in this second class I would mention the yellow warbler or spider bird, *Dendroeca aestiva*; the red start, *Setophaga ruticilla*; the red-eyed and yellow-throated vireos, *Vireo olivaceus* and *V. flavifrons*; the various species of woodpecker, *Picidæ*, and the blue bird, *Siala sialis*.

The birds comprised in the third class are only partially insectivorous. Among the common species are the cat-bird, *Galeoscoptes Carolinensis*; robin, *Turdus migratorius*, and brown thrush, *Harporhynchus rufus*; the sparrows, *Fringillidæ*; the cuckoos, *Coccydæ*; the nuthatch, *Sitta Carolinensis*; chickadee, *Parus atricapillus*; kinglets, *Sylviidæ*; meadow-lark, *Sturnella magna*; Baltimore oriole, *Icterus Baltimore*, and the wren, *Troglodytes ædon*. Besides these there are the blackbirds, *Icteridæ*, which in the spring devour more or less insect food, but feed chiefly on grain and seeds during the remainder of the year. Nearly all birds, excepting the rapacious species, feed their young on such soft food as worms, caterpillars, soft-bodied insects and fruit, and from the time that young birds are hatched until they acquire the power of flight, a very large quantity of insect food is undoubtedly consumed; but the question of the greatest practical importance to the agriculturist is how far are the birds a help in keeping in check *injurious* insects. With the object of obtaining light on this point, I have, with the help of my son, W. E. Saunders—who has for some years paid special attention to this matter—examined the contents of the stomachs of a large number of birds, and I must frankly confess that the larger the experience gained in this direction the more I have been convinced that but comparatively little help is got from birds in keeping in subjection *injurious* insects.

When the cut worms were so common with us this spring that any bird with a very little effort might have had its fill of them, the contents of a number of stomachs were examined, especially those of the robin, but not a single specimen of this larva was found in any of them. It has been urged that some birds devour the larvæ of the plum curculio by picking them out of the fallen fruit, but I have failed to find any confirmation of this statement, indeed never found a curculio larva in the stomach of any bird excepting once in that of a robin, who had evidently swallowed it by accident when bolting a whole cherry. As for the robin having any claims upon the sympathies of man for the good he does, I

fear that but a very slight case can be made out in his favor. Of fruit he is a thief of the worst kind, stealing early and late, from the time of strawberries until the last grapes are gathered; not content to eat entirely the fruit he attacks, but biting a piece out here and there from the finest specimens, and thus destroying a far greater quantity than would suffice to fill him to his utmost capacity. At the time of writing, flocks of the most pertinacious specimens are destroying the best of my grapes, while alongside is a patch of cabbages almost eaten up with the larvæ of the cabbage butterfly—nice, fat, smooth grubs, easily swallowed, but no such thing will Mr. Robin look at as long as good fruit can be had. His tastes are so expensive that to gratify them is to deprive the fruit grower of a large portion of his profits, hence the sooner the robin ceases to be protected by legislation the better it will be for all lovers of fruit.

The insect world is composed of myriads of specimens which from their varied structure and habits admit of being classified into families, each distinct and usually easily recognizable to the practiced eye of the Entomologist. A large portion of this innumerable host is appointed to prey upon and devour the other portions, and thus it appears to me that apart from any consideration of insectivorous birds, that the insect world would and does to a large extent take care of itself, and when an injurious species increases beyond its normal limits, its natural insect enemies having an unusual amount of material to work on, soon become sufficiently numerous to reduce the number of the injurious insect to its normal proportions again. As an illustration take the now common cabbage butterfly, *Pieris rapæ*. This insect was in some way brought from Europe to Quebec a few years ago. From Quebec it has since spread over an immense area extending now from Alabama to the waters of Lake Superior, eastward to the Atlantic, and westward many hundreds of miles, and over all this district it has done immense damage to the cabbage crop. Throughout this area insectivorous birds of all sorts prevail; the butterfly is conspicuous, not very strong in flight, and during the day almost constantly on the wing; the larva feeds in exposed situations, is of that smooth character which birds are said to prefer, and although similar in color to its food plant, is not difficult to detect. Here, then, is an instance where a comparatively feeble insect, particularly vulnerable to attack, has rapidly spread over a large portion of this continent with little or no opposition from insectivorous birds. Indeed I have never yet found or known to be found a single example either of the butterfly or

its larva in the stomach of any bird. In its native home in Europe it is seldom so very destructive as here, for the reason that a small four-winged fly, *Pteromalus puparum*, an insignificant looking little creature, is a parasite on the larva of this butterfly, and hunts its victims with the greatest assiduity; alighting on their backs and thrusting its slender ovipositor through the skin of the larva, it deposits a number of eggs there, which hatch into tiny grubs, and these feed upon and eventually destroy the caterpillar. By the constant efforts of this little parasite the cabbage butterfly is prevented in Europe from becoming a very serious pest. Fortunately this little friend has also been introduced here from Europe, although in what manner is not known, and is rapidly spreading, following in the wake of its prey, and where the parasite has fairly established itself this butterfly, with its numerous progeny of green caterpillars, soon dwindles in numbers so materially as shortly to cease to be so grievous an evil. The butterfly spreads faster than its enemy and is usually several years in advance of it, but we may confidently anticipate that sooner or later this small fly will do for us what it has done for Europe—keep this troublesome insect within due limits. Many other similar examples might be given.

Further, the help of friendly parasitic insects is so much more efficient because it is in most instances discriminating. As far as is known, the little parasite referred to attacks only the larva of the cabbage butterfly, and in like manner many other parasitic species are restricted in their operations to a single species, while in other instances they are confined to a genus or a group of similar species. This is not so with insectivorous birds; they in most instances devour alike the useful and the injurious species, and the question may well be raised in many instances whether the good they do is not more than counterbalanced by the number of useful insects they devour. Recent observations on the family of thrushes by Mr. S. A. Forbes, of Illinois, seem to show that their insect food consists largely of beetles belonging to the Carabidæ, a family every member of which is useful, since they feed both in the larval and beetle states exclusively on other insects.

The field here open is a wide and inviting one, on which I trust some of you will enter. I have but touched upon it; as the results of more extended observations are recorded the opinions here expressed may need modifying. I desire to do justice to the birds.

During the month of August last it was my privilege to visit the Great

Manitoulin Island, also Sault Ste. Marie and the district adjoining. Although prevented by an accident from indulging in free locomotion, still I saw much that interested me. On Manitoulin Island I found many of the species of butterflies common in the more southern portions of Ontario; a few moths were also captured. On the shore of Elizabeth Bay, near the western extremity of the island, a full-grown larva of *Attacus luna* was picked up, and on enquiry I learned that earlier in the season that beautiful moth was quite common in that neighborhood.

In the department of Economic Entomology some items of interest were gleaned. The pea crop throughout this district is an important one, and I made a diligent search in many fields for indications of the presence of the pea bug, *Bruchus pisi*, but could find no traces of it. Satisfactory evidence was furnished me in at least two instances of the sowing of seed brought into the island which was badly infested by this weevil, yet I was assured that neither during the season following nor in subsequent seasons did the crop suffer from this pest. The pea crops growing in these particular localities were also examined by me. Hence it would appear that the climatic or other conditions prevailing in this district are so unfavorable to this destructive pest that it is unable to survive. Should this exemption prove permanent, the cultivation of the pea there will doubtless be rapidly extended, as there will be a large demand at good prices for seed peas from this section, since so many portions of the Province are now so overrun with the pea bug that it is difficult to get seed fit for sowing; and, for the same reason such seed peas will be readily purchased for planting in the Western States.

For many years the district extending from Goderich to Collingwood has, in consequence of its exemption from curculio, been extremely favorable for plum culture, and here immense quantities have been grown and shipped to other parts of Canada and the United States, Goderich being for many years an important centre for the production and shipment of this fine fruit; but within a brief period this foe has invaded Goderich in such force that to grow plums successfully there warfare must now be maintained against this pest similar to that practised in the more southern sections of the Province. This enemy has now advanced as far as Southampton, and before many years we may reasonably expect that the favored district at present exempt from Owen Sound to Collingwood will be similarly invaded. Thinking that the Manitoulin Island, from its insulated position, might possibly offer in the future a fine field for this department

of fruit industry, I examined carefully whenever opportunity offered for evidence of the presence of this insect. In the neighborhood of Manitowanning I found two trees of Lombard, a blue plum the name of which I could not ascertain, and two wild plums, all fruiting, but could find no traces of the work of the curculio; but on a farm in about the centre of the island, three miles from Gore Bay, I found on a wild plum tree which was fruiting in a farmer's garden a number of stung plums, and on opening one of them found the larva of the plum curculio nearly full grown. Since wild plums are found in many parts of the island, it is probable that the curculio will be found in other districts there. I saw several wild plum trees at the Sault Ste. Marie, but had no opportunity of examining the fruit satisfactorily; from what I saw I was led to believe that there was no curculio in that region. The cultivation of fruit both at the Manitoulin Island and at the Sault is so entirely in its infancy that it is difficult to form any decided opinion as to the probable future of this department of industry in those districts.

In many sections forest fires have destroyed a considerable proportion of the original woods, leaving many of the larger trees standing scorched and dead. From these much marketable lumber could be got were it not for the destructive work of the wood-boring beetles; these troublesome creatures have bored through the trees in every direction, and thus made the timber obtainable from them worthless for market, and useful only in the construction of barns, sheds, etc., on the property of the owners. Both of the large species of long-horned beetles, *Monohammus confusor* and *scutellatus*, appear to be abundant, the latter I think most common; some of the small wood-boring beetles belonging to the family Scolytidae are also very numerous.

The cabbage butterfly, *Pieris rapæ*, has within the last two or three years spread over the whole of the area I visited, and is playing sad havoc with the cabbage crop. In Manitoulin Island I found a specimen or two of the Colorado potato beetle, and made further search among growing potatoes, but could find no more. I was informed that this beetle had been seen occasionally for several years past, but that it had not made any headway in any part of the island. Another insect was found attacking the potato vines, although not injuring them very much. I refer to a species of blistering beetle, *Epicauta pensylvanica*? called here the black bug. In some potato patches it was quite abundant, and the leaves were partially devoured, but nowhere did I see them in sufficient numbers to

materially injure the crop. Since the larva of this insect is found only in the nests of bees, wasps, etc., where it feeds on the young of these nest-making insects, and consumes the potato vine only while in the perfect or beetle state, no serious injury is likely to result from its presence. Its larval habits are such that if abundant one year, it is almost sure to be correspondingly scarce the following season.

In the garden of Mr. J. C. Phipps, the Indian Agent of the Government at Manitowanning, I was surprised to find that the oyster-shell bark louse, which injures apple trees, was not only abundant on the apple trees, but the stems of both black and red currant bushes were also thickly clad with them to such an extent as to have killed a number of them. I had never before seen this destructive insect attack the currant, but it has been occasionally observed on currant bushes in the United States.

For several years past I have had occasion to refer to the depredations of the forest tent caterpillar, *Clisiocampa sylvatica*, which has devastated our gardens, orchards and forests; it has now happily almost disappeared, a result brought about, I have no doubt, mainly through the agency of parasitic flies, several species of which have been preying on them extensively. In some sections of the Province the rose-bug, *Macrodactylus subspinosus*, has been abundant and injurious. In 'East Flamboro' I am informed that they were very destructive to the sweet cherries, devouring the fruit, and that they also injured the grape crop by eating the bunches shortly after blossoming. Some grape growers have also suffered considerably from the attacks of the grape vine flea-beetle, which devours the buds just as they are swelling in the spring.

At the late meeting of the Entomological Club of the American Association for the Advancement of Science, in Boston, our Society was represented by Mr. H. H. Lyman, of Montreal, and the Rev. C. J. S. Bethune, whose able report of the important proceedings of the Club will be read with interest. It is gratifying to learn that the good work done by the Club has given it such a standing that the Association has seen fit to establish it as a permanent Sub-section, and the more important papers read will in future be published in the yearly volume of Proceedings.

During the year the New York State Legislature has appointed J. A. Lintner, of Albany, N. Y., as State Entomologist. New York was the first State in the Union to look after the interests of agriculture in this

direction and appoint an officer for the special purpose of reporting on noxious insects. The many reports of the late Dr. Fitch, extending over a lengthened period, are well known and much valued; his successor, Mr. Lintner, is a man peculiarly fitted for the position—a most patient and accurate observer, a skilled Entomologist with an experience in this department of some thirty years, he brings to the task all the necessary qualifications. Seldom has there been an appointment so judiciously made, and I feel sure that great good will result from it.

Since I last addressed you a special Commission has been appointed by the Ontario Government to inquire into the agricultural resources of the country, and the progress and condition of agriculture therein, and recognizing the important and intimate connection of Entomology with agriculture, the Government has seen fit to appoint your presiding officer as one of the Commissioners. In performing the duties devolving upon me in this position I shall endeavor to give to Entomological matters bearing on agriculture that prominence which their importance demands.

WM. SAUNDERS.

THE HESSIAN FLY NOT IMPORTED FROM EUROPE.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

The official publication of Bulletin 4, "The Hessian Fly," by Dr. A. S. Packard, for the N. A. Entom. Commission, has induced me to study again the question of the importation of this insect by Hessian troops at an early period of the war. The excellent memoir by Dr. A. Fitch was believed to have settled this question in a final manner; therefore his opinion was accepted by all subsequent American writers.

The best German monograph on the Hessian Fly was written and published twenty years ago, in Hesse, by Dr. B. Wagner. He acknowledges fully the merits of Dr. A. Fitch's monograph, but he objects to the historical part and the conclusions based upon it. As Dr. Wagner's work seemed to have settled the question so thoroughly that for twenty years no scientist in Europe has believed in the Hessian importation, I was rather astonished to find in the Bulletin a reprint of the old story, without the slightest acknowledgment of their refutation by Dr. Wagner.

I have tried myself to compare as much as possible the different publications quoted by Dr. A. Fitch, and arrived at these conclusions :

1. That it is impossible that the fly could have been imported by the Hessian troops.

2. That it is very probable that the fly was here before the war.

3. That the fly was not known to exist in Germany before 1857.

It has been entirely overlooked that Dr. A. Fitch states himself that he has been unable to fill an important *desideratum*, to make his proofs conclusive ones. He says : "We have searched in vain for the date of the embarkation of the troops or the number of days occupied by them in crossing the sea." There were indeed long before published those data, but in two works which even to-day are not to be found in any library here.* Both these works and the official manuscript report are used by Dr. Wagner. But there exist newer publications, all easily accessible here, but strangely enough, appear never to have been consulted.†

I. It is impossible that the fly could have been imported by the Hessian troops.

Dr. A. Fitch arrived, after his study of the habits of the fly, to the conclusion "that there is but one mode and but one month in the year in which this insect could probably have been conveyed to this country at that time, to wit, in straw landed upon our coast in August." (p. 29)

Everybody will agree that Dr. Fitch's reasoning is acute and to the point. As his monograph is known by every student, it is not necessary to repeat in full his conclusions (p 8-9). But he has forgotten in his calculations that the pupa state of the fly has in the summer only the duration of two months or less, and that every ship for a voyage from Europe, required on an average nearly four months ; and that straw

* The Biography of the General von Ochs, by L. von Hohenhausen, Cassel, 1827, and F. Pfister die Fahrt der ersten hessischen Heeres abtheilung von Portsmouth nach N. York : Zeitschr. der Vereins fuer hessische geschichte und Landeskunde, Tom. II., Cassel, 1840.

† Max von Eelking: Die deutschen Huelfstruppen im Nordamerikanischen Befreiungskriege, 1776-1783, Hannover, 1863, 2 vol.

By the same author : The biography of General Riedesel, Leipzig, 1856, 3 vol.

Friedrich Kapp : Der Soldatenhandel deutscher Fuersten nach Amerika, Berlin, 1864.

Bancroft's History, vol. viii., ix.

infested with these pupæ, to be conveyed at this time, must have been taken anterior to the harvest. Dr. Fitch tries to explain this in a queer way: "Had a company of soldiers needed straw for package, no objections would have been made to their going in a field (infested by the fly) and with a scythe gathering what they required weeks before the usual time of the harvest." Dr. Wagner is rather mortified by this funny conception of the military discipline of the Hessian troops. But the supposition is more untenable as the sending of the troops was rather unpopular; their passage was objected to by several parties, and they had to make long and various circuits, and to conduct themselves in a very cautious manner. Further, the minute official reports would have preserved details of such entirely unusual events. The first division of the Hessian troops was ready to depart in the middle of February, 1776. The troops were ordered to march from Cassel through Hanover to Bremen. As the British transport ships had not yet arrived at Bremenhaven, the troops returned to Hesse, and started again February 29th. In passing Bremen March 10th, every regiment had to be transported on seventy wagons, because the whole country was inundated by the Rivers Weser and Wumme. The small number of wagons shows that the baggage could not have been very large. The troops arrived March 21st to 22nd, at Bremenhaven, and were embarked from March 23rd to April 15th, as the transport ships arrived only slowly. The fleet started April 17th, arrived in Spithead April 28th, left May 6th, and arrived August 17th at Sandy Hook. Some ships (after Dr. Wagner's statement) seem to have reached Halifax July 7th, and Utrecht, off Long Island, August 12th. Several transport ships left Bremenhaven April 21st, and Portsmouth May 12th, but arrived at the same time with the others at Sandy Hook.

The accommodations for the troops on the ships were all furnished by England. "The bedding," says Bancroft, "was infamous scanty; their pillows 7 by 5 inches, small mattresses and woollen blankets, hardly together weighing seven pounds." Every six men slept together, in a partition 5 feet long and 6 feet broad. When the men were tired lying on one side, they had all to turn at the same time to the other side. Now if it had been possible that the bedding contained infested straw, everybody will agree that its use for three months and a half by soldiers placed so uncomfortably is more than the most persistent Hessian fly would be able to stand. The idea that camp straw had been conveyed by the

transport ships is of course impossible, when all necessary accommodations had been more than shortened.

The division was ordered, August 19th, from Staten Island to Long Island, and arrived August 22nd at Flatbush. The official records state that only the tents and the baggage were transported on very small and odd-looking wagons, each with only two small horses. Here again the supposition that camp straw had been transported is entirely improbable, the more as it is stated that "the troops found Long Island well provided with everything, even to a certain degree of comfort and luxury."

These troops left Hesse in February, and Spithead in May, also long before straw could have been made, and could not have imported the fly. *These are the very troops Dr. Asa Fitch speaks of with confidence as importers of the Hessian fly.*

The second division of the Hessian troops left Cassel in May, 1776, Bremenhaven June 3rd, arrived at Spithead June 20th, sailed together with the Waldek troops July 20th, and arrived October 21st at New Rochelle, Long Island. The date of their arrival alone proves that the importation of the fly by them was impossible.

All other German troops dispatched in 1776 were landed in Quebec. The Braunschweig troops left February 22nd, arrived at Stade March 5th and at Portsmouth March 20th. The Hanau troops left March 15th, and were embarked March 26th at Nimwegen. Both troops together sailed from Portsmouth April 7th, and arrived June 1st at Quebec. Of course its importation by these troops is out of the question.

During the year 1777 the following German troops were sent to America: From Hessen Cassel, which left March 2nd, were shipped on the Fulda May 18th, embarked May 25th at Bremenhaven, and arrived September 27th at Sandy Hook. From Hessen Hanau, which started March 7th and 31st for Dordrecht; from Braunschweig, which arrived March 12th at Stade; from Anspach Bayreuth, which left February 29th, and were embarked March 30th at Dordrecht. All left Portsmouth together April 7th, and landed June 3rd at Staten Island, and were ordered June 11th to Amboy, N. J. Comparing the dates of their arrival, an importation of the fly by those troops is impossible.

The data for the following years are without importance, as the fly appeared in fall of 1778 in New York. But it may be stated that during 1778 the troops from Hessen and Bayreuth arrived, Sept. 25th, also too late to import the fly.

All troops from 1779 to 1782 landed in Quebec or in Halifax. Only in 1780 troops embarked August 15th, arrived October 17th in New York.

I think in comparing all these data, everybody will agree that the fly could not have been imported by those troops. There has doubtless been too much patriotic impulse and indignation prevailing in accepting without any real criticism these old traditions. Patriotic motives are the worst guides in scientific questions.

II. It is very probable that the fly was here before the war.

I regret that I am not acquainted with the older American literature, and I have no means to get at it. Therefore I know only one statement, quoted by Dr. A. Fitch, which seems to Dr. Wagner and myself to prove that the Hessian fly had existed here before the arrival of the Hessian troops. The statement (I have seen the original communication) says: "A respectable and observing farmer of this town (Renselaer, N. Y.), Colonel James Brookins, has informed me that on his first hearing of the alarm on Long Island in the year 1786 (Fitch says doubtless 1776 is intended), and many years *before* its ravages were complained of in this part of the country, he detected the same insect upon examining the wheat growing in his town. These facts prove pretty satisfactorily that the Hessian fly or wheat insect is indigenous in this country."

Dr. Fitch rejects the testimony with some sarcastic phrases, and adds: "The strong probability is that it was some other insect which was found by Col. Brookins." I don't see how such testimony can be rejected. There is no need to doubt that a respectable and observing farmer would recognize the devastations done by the Hessian fly. Every one, even the most unobserving man, having seen once such a devastated field, will recognize and remember the fact. Moreover, there has not existed, nor does there exist now in the U. S., according to *Dr. Fitch's own writings*, an insect which produces similar ravages.

Dr. Fitch makes similar objections to the statement of Mr. Mitchell that the fly had appeared on Long Island in 1776, before the arrival of the troops. He says the devastations were conspicuous and liable to attract attention, and leaves us in the dark when Col. Morgan states that in 1778 the fly made its first appearance, and directly after that Mr. Clark states that the fly made its first appearance in 1779, so that at least one of them must have been mistaken.

III. The fly was not known to exist in Germany before 1857.

The fly must have existed in Europe and in Germany before it could have been imported with the troops. Dr. Fitch tries to settle this most important question by the following statements :

Mr. Duhamel, in Monceau (I have compared the original), says that "a number of white worms have been found on the wheat near Geneva, in 1755, which after a time turn to a chestnut color; they place themselves betwixt the leaves and *gnaw the stalk*; they are commonly found betwixt the first joint and the root; these animals appeared about the *middle of May*."

It is rather strange that just this passage has been quoted and always reprinted. Mr. Duhamel says plainly, "the larva gnaws the stalk." Now Dr. A. Fitch says (p. 33), "the larva of the Hessian fly lives upon the sap; *it does not gnaw the stalk*." And Dr. Packard says (p. 15), "their soft and fleshy undeveloped mouth parts *do not enable them to gnaw* the surface of the plant."

The fact that the stalk was gnawed shows evidently that the insect was not the Hessian fly, but a species of *Oscinis*; the larvæ of some species of which would gnaw the stalk—or perhaps *Opomyza florum*. The pupa of those species is also brown and appears above the root between the leaves and the stalk, and the imago appears just as Duhamel states, in *the middle of May*, one month later than the Hessian fly. Prof. J. Kuehne remarks that the effects produced upon the plants by *Opomyza* are similar to those of the Hessian fly.

Therefore the quotation of Duhamel is entirely out of place, and this is, by the way, *the only one* by which the existence of the fly in Europe before the war has been corroborated, I have gone through the literature from 1770 to 1804, without finding any statement of similar devastations of wheat, for Germany, for France and for Spain. There exist a number of books where such a calamity in France would have been noted if it had existed.

I have not been able to consult the long and detailed report of Sir Joseph Banks to the British Government. An extract given by Kirby and Spence shows that the fly did not exist in England in 1788, and that no where on the continent its existence or similar devastations were known.

In 1834, Prof. Kollar, of Vienna, in his treatise on injurious insects, published an account on some devastations done by the Hessian fly—he has first in Europe used this name for a European species—in Altenburg,

Hungary, and in Weikendorff, 17 miles from Pressburg, an estate belonging to the Prince of Sachsen-Coburg. Dr. A. Fitch quotes both as "Saxe Altenburg and Saxe Coburg, about a hundred miles distant from Hesse Cassel." "It is a strange geographical mistake," says Dr. Th. W. Harris (Corresp. p. 189), "to transport those localities to Saxe, whereof Altenburg is 400 miles distant, and Weikendorff near the border of Hungary, about 375 miles distant." Nevertheless Dr. Packard reprints again the strange mistake made by Dr. A. Fitch, as *the only proof for the existence* of the insect in a district not far distant from Cassel.

The careful study of Prof. Kollar's report makes it very doubtful if his insect is the Hessian fly. He describes the larva as pale green with a small black dot above, which does not at all agree with the Hessian fly, but very well with the larva of a Chlorops. He states having reared *but one fly*, but he describes *both sexes*. His description is simply a translation of those of Th. Say, and not a correct one, as he translates several times fulvous for golden.

I have never seen the dissertation on the same calamity by Dr. Hammerschmidt, Vienna. It is printed in a small number for private circulation. Prof. J. C. Westwood having received specimens of the pupa in the straw, doubts if it is the Hessian fly. Perhaps the strictures on his report by Dr. A. Fitch (p. 8) are correct, as they have never been refuted by Prof. Westwood. But it is to be remarked that *C. destructor* is not the only species of the genus having a coarctate pupa. Dr. Fitch (p. 40) has detected one on *Agrostis lateriflora*, and Mr. Winnertz states the same for *C. graminicola* from Europe.

All European works on the Hessian fly, published after 1857, agree that it was then an entirely new pest, never seen before and unknown to all prominent Dipterologists—Wiedemann, Meigen, Zetterstedt, Loew, Bremi, all monographers of this genus, and Schiner. The species was represented in no collection, and apparently not in the Vienna Museum, as Mr. Schiner, 1864, quotes as localities for Europe only those given by Mr. Dana. Nevertheless I am obliged to state that 30 years later, after Mr. Haberlandt, the Hessian fly, *C. secalina*, has been observed in the same parts of Hungary.

The only sure statement of the existence of the Hessian fly in Europe is its discovery by Mr. J. Dana in 1834, at Mahon, Toulon and Naples. The identity of this insect with the American species is to be accepted on Th. W. Harris's authority. There was never a better authority, and

scarcely one who has better known the insect. He has given his conviction of their identity in the most unequivocal terms. The statement that the insect had been in Minorca from time immemorial, and often done great damage both there and in Spain, is very interesting, but not to be accepted as certain before having been corroborated by reliable reports. I am not able to compare the old Spanish literature, but I think it should be done.

The existence of the fly in Asia Minor, near the shore, is probable from the discovery made by Prof. Loew of the larva and pupa on the straw in 1842, and later recognized by him as identical with his *C. secalina*.

Mr. V. von Motschulsky describes in 1852 a fly very obnoxious to the wheat in the governments of Saraton and Simbirek, in Rusland, as *C. funesta*, together with its parasites. I may add that von Motschulsky, after his return from America, and having received typical specimens of the Hessian fly and its parasites from Dr. A. Fitch, has assured me that *C. funesta* and *C. destructor* are the same species. This is also accepted in von Osten-Sacken's catalogue. Mr. Koeppen, in his excellent work just published "On Injurious Insects in Rusland," states that since that time nothing has been known about the fly in those parts of Rusland. "Before 1879," says Koeppen, "we had no reliable report about the existence of the Hessian fly in Rusland, which was discovered in Poltowa and Sula by Mr. Lindemann in the summer of 1879, together with its parasites."

In 1857 and 1858 the rye was extensively damaged in Silesia, Posen and Prussia. Prof. Loew, at the time the leading Dipterologist studied the insect, and declared it to be very similar to the Hessian fly, but probably a new species named by him *C. secalina*. He had never seen the American species, and had to rely on Dr. A. Fitch's description, which did not fully agree with *C. secalina*. In 1859 the same insect was very obnoxious to the rye in Eastern Prussia, and was studied by myself. In 1860 it had advanced westward to Augusburg, where it was studied by Prof. Rosenhauer, and to Fulda, Hesse. Everywhere it was considered to be an entirely new pest, never seen or observed before. In Hesse the fly was studied by Dr. B. Wagner, and his monograph is perhaps the most satisfactory existing in Germany, though it seems to be entirely unknown here. The fly destroyed in Hesse wheat, rye and barley. I am not able to say whether the insect did advance farther west. In the following years the calamity subsided, and was soon nearly forgotten. Extensive destructions in Hungary in 1864 are reported by Mr. Haberlandt and Kuenstler,

and in 1879 in Rusland. I find no statements of injury done by the fly in Germany after 1860, and the reports for Bohemia for 1872 and 1879 state directly that the fly was not observed. Dr. Schiner, in Vienna, had till 1864 seen no specimen; the best proof that it had not been obnoxious in Austria.

Dr. Wagner was the first to acknowledge the identity of *C. secalina* and the Hessian fly. In observing the manner of life and the time of swarming of the fly in Hesse, and comparing both with the time of the departure and the arrival of the Hessian troops, Dr. Wagner comes to the conclusion that the importation of the fly by those troops is strictly impossible.

If we consider the positive evidence of the existence of the Hessian fly in Europe, we find that between 1830 and 1840 it occurred in four localities on the northern shore of the Mediterranean. It appeared in 1850 more to the north in southern Rusland, and advanced strictly westward through Germany till 1860 as a very obnoxious pest. After all I think it would be hardly more difficult to accept and to prove that the fly was introduced by the energetic trade with the Mediterranean from America, and became obnoxious only after acclimatisation, as to accept the introduction into America from Europe. It is difficult to suppose that the fly had been overlooked by such a number of prominent Entomologists as those named. Dr. Wagner accepts as a fact that the fly was imported from Asia to Europe and from Europe to America. The same supposition was made long ago by T. W. Harris, because the fly is connected with the cereal grasses, and therefore their original home was presumed to be the same with those plants. Against this conclusion I have to make two objections. First, the fatherland of these plants is unknown. That they live still wild in Persia, as Dr. Wagner supposes, is not proved at all. Buffon also remarks that our cereals are not known to grow wild anywhere, and later statements have always been proved to be unfounded. The fly is not found till now in the Orient. Second, *it is not true* that such an obnoxious insect is strictly limited to some few species of plants. The potato bug has given abundant evidence that an insect not obnoxious before may become so by finding a related plant better suited to its taste. Dr. A. Fitch (Rep. II., p. 297) well says, in speaking of some wheat and barley flies, "As these flies appear to be native species, it is probable that before wheat was cultivated upon this continent they sustained themselves upon some of our wild grasses. Their numbers

must therefore have been very limited at that period. But when wheat was introduced and became extensively cultivated, it gave them such an ample supply of most palatable nourishment that they have gradually increased, and are now excessively numerous, laying every wheat field under contribution for their support." Is it not obvious that the same course may have happened with the Hessian fly? The more so since just at the time of its appearance in Long Island and the adjoining country, the culture of wheat was prominently advanced. Since we know that at the utmost during six weeks in the year only is the importation of the fly possible, such an importation to America before the discovery of steamships is almost inconceivable. Even if purposely undertaken with all care such an importation would almost surely have been a failure.

Dr. Wagner has felt the strength of those arguments, and supposes that importation had been possible only from the nearest coast of France. He believes that the lesser distance, as well as the frequent trade with France, makes it more probable. But why not accept that the fly was indigenous here as well as in the old world? There are Diptera identical with European species, which nobody would think to have been imported. I may mention the common *Trichocera regelationis*, which belongs to a related group. The species is common here, and was observed by me 13 years ago. But last winter I had specimens sent me from Maine, stating that this insect had never been seen there before, and had been extremely troublesome. I know well that many animals—higher and lower ones—have been imported, because the facts are well recorded; I believe that a number of others have also been imported, for which the facts are not recorded. But I see no reason to go farther, and am prepared to accept that the same species in both countries may have been developed under similar conditions. I consider, therefore, the Hessian fly to be an indigenous American insect, and not imported by Hessian troops.

A few words more concerning the periods of unusual abundance of the fly. I was very much interested in the study of the table given by Dr. Packard, but I arrived at the conclusion that the table is not sufficient, and indeed is considered by Dr. Packard himself as very imperfect. Concerning N. England Dr. A. Fitch's statement has been overlooked, Regs. viii, p. 203, that the fly was very injurious in Bercks Co., Mass., in 1779.

The year 1823 for Maine, and 1857 for Ohio, are not marked at all in the table, and both the records state that the farmers had ventilated

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earnestly the question to give up entirely the cultivation of wheat. The only conclusion to be made by the table would be that with an intermission of 30 to 40 years, a period of superabundance follows. Perhaps a careful study of the old records from 1748 to 1750 would give some evidence, if the fly has ever been obnoxious here before the war. It is a curious fact that such an intermission of the appearance of the Hessian fly has occurred just in that quarter of the century, during which the most ardent collector and student of the N. American Diptera—I may say the founder of the American Dipterology—was here. In fact, Baron Von Osten Sacken has never met here with this Hessian fly, which is not represented in his collection nor in Prof. Loew's, both now in the Museum in Cambridge.

NOTE.—As the paper was going through the press, I received two pairs of *C. destructor* from Prof. J. A. Cook, the first American specimens which have come to my hands. In comparing these with two pairs of *C. secalina* from Prussia and Hesse, I was astonished to find the American insects twice as large as the European ones, and almost entirely black. I think they look so different that the identity is perhaps not sure. But a larger series from both countries and a more detailed knowledge of Diptera than are at my command, would be needed to decide the question.

TWO NEW SPECIES OF EUPELMUS, WITH REMARKS UPON E. (ANTIGASTER) MIRABILIS, WALSH.

BY L. O. HOWARD, WASHINGTON.

EUPELMUS REDUVII n. sp.—*Female*.—Average length of body 2.4 mm. Average wing expanse 4.6 mm. Head slightly wider than thorax, which is of equal width with abdomen. Antennæ sub-clavate, as long as thorax. Collar rather long, much narrowed in front and concave above. Anterior half of mesothoracic scutum convex; a broad, longitudinal depression posteriorly, the anterior corners of which are extended on in the parapsidal furrows. Scutellum small, much narrowed in front. Abdomen somewhat concave above, keeled below. Middle tibial spine stout, but not quite so long as first tarsal joint, which is much widened and has a double row of serrations on its inner edge; second tarsal joint also

widened and doubly serrate, but not nearly so much so as the first. Head densely punctured. Scutum apparently smooth, in reality very slightly punctured. Scutellum more coarsely punctured than the head. Abdomen smooth. Color: Head dark metallic green; eyes dark brown; antennal scape light yellow brown, flagellum black with extremely short whitish pile; scutum dull metallic green, appearing coppery brown in most lights; scutellum brilliant light metallic green; sides of the mesopectus yellowish; front legs yellowish brown, darker along the upper side, tarsal claw dark brown; middle legs the same, spine light yellow-brown, serrated edge of first two tarsal joints nearly black; hind legs all dark brown, lighter underneath. Front wing with a quite well-defined, dusky, transverse band, at the point where the sub-costal vein reaches the costa, and with another transverse band at the point where the stigma is given off, with its proximal border convex and well-defined, and its distal border shading gradually to a hyaline wing tip. Sub-costal vein reaches costa at one-third the wing length, and the stigma is given off at two-thirds.

Male.—Average length 1.5 mm. Average wing expanse 3 mm. Head of same width as thorax and much wider than abdomen. Antennæ rather slender, sub-cylindrical, attenuated at tips, somewhat hairy, as long as thorax. Collar normal. Parapsides of scutum distinctly separated. Scutellum so narrowed in front as to be pointed. Middle tibial spur nearly as long as first tarsal joint. Sub-costal vein reaches costa at two-fifths the wing length and gives off stigma at three-fifths. Head with delicate transversely elongate punctures. Thorax with a delicate hexagonal sculpture and sparsely scattered pits, from each of which arises a short hair. Abdomen smooth. Color: Eyes and antennæ dark brown; head, prothorax and mesothoracic scutum dark metallic green; the rest of the thorax coppery brown; abdomen dark brown, nearly black, front legs uniform light yellow, except tarsal claw, which is brown; middle femora yellowish with a brown stripe along upper edge, tibiae yellow with a brown annulation at distal end, spine yellow, first and second tarsal joints yellow, all others brown; hind femora brown, proximal half of tibiae yellow, the remainder dark brown; all coxæ yellow; wings clear, subcostal nerve and stigma light brown.

Described from 3 ♂'s, 4 ♀'s, reared from the eggs of *Reduvius novenarius*.

EUELMUS FLORIDANUS n. sp.—*Male*.—Length of body 2.1 mm. Wing expanse 3.1 mm. Body rather slender. Head large, slightly wider than thorax. Thorax and abdomen long and narrow; abdomen tapering from fifth segment to base. Antennæ thick, cylindrical, somewhat shorter than thorax. Collar short. Scutum large and prominent; parapsidal furrows obliterated. Face finely impressed with transversely elongate punctures; top of head rather coarsely punctured; thorax as with ♂ *E. reduvii*; abdomen smooth. Color: Head and thorax metallic green, appearing golden or coppery in different lights; eyes reddish brown; antennæ and abdomen dark brown, nearly black; front femora very light yellow, tibiæ light yellow with a brown patch above, tarsi fuscous, the last joint darker than the others; middle femora light yellow with a slight fuscous patch above, tibiæ dark brown, yellow at either end, tibial spine whitish, first three tarsal joints whitish, last two dark brown; posterior femora light yellow with a very broad dark brown annulation in the centre, femero-tibial joint brown, tibiæ dark brown with a light yellow distal end, tarsi whitish except last two joints, which are dark brown; all coxæ yellow, stigma and subcostal vein light brown.

Described from one ♂ specimen bred from an unknown Tineid larva on orange, taken at Jacksonville, Fla., by Prof. Comstock.

EUELMUS (*ANTIGASTER*) *MIRABILIS*, Walsh.—The rearing of a number of specimens of this interesting Chalcid from eggs of *Microcentrum retinervis* collected by Prof. Comstock at Jacksonville, Fla., has given me an opportunity to verify a suspicion which I have for some time entertained, namely, that there were no grounds for the founding of the genus *Antigaster*. A comparison of the specimens with Walsh's description shows the latter to be an excellent one; but there is not a single structural character mentioned by him as belonging to this "anomalous" genus, but what belongs equally well to the old genus *Eupelmus* Dalm. As to the habit of elevating its abdomen which Walsh considered so particularly anomalous, it is such a well-known thing to European writers that its seeming absence in *E. Geeri* caused Ratzburg a momentary doubt as to this species being a *Eupelmus* (see Ichn. d. Forstins, iii., p. 199). In the allied genus *Eusandalum* Ratz., and possibly in other Eupelmide genera, the same thing is seen, but in a slighter degree. Prof. Riley seems to have suspected this when he says: (6th Mo. Rep., p. 162) "No other species is so curiously constructed for rolling backward into a perfect

ball, unless it be some belonging to the very closely allied genus *Eupelmus*."

I happened to observe the process of copulation with *E. mirabilis*, which took place in the following way: The males issued a day or two before the females. The first morning that a female made her appearance I happened to be watching the breeding jar. Presently one of the males ran up to her and began stroking her antennæ, the antennæ of the male opening and shutting laterally, while those of the female made the usual up and down motion. After this had continued for some minutes, the male ran around her and took an erect position at the posterior end of her body, so that the two insects were at nearly right angles to each other, the male being supported by his middle and hind legs, and the end of his abdomen being closely applied to that of the female. Coitus lasted 30 secs., when the male withdrew his bilobed penis, and, curiously enough, ran forward upon the thorax of the female and seemingly clawed her violently with all of his feet. He then jumped down and ran away. I saw the operation upon one other occasion, when it was performed in a precisely similar manner.

ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The annual meeting of the above Society was held, according to announcement, in the City of Hamilton, on the evening of Tuesday, the 28th of September, in the City Hall. A number of those especially interested in Entomology in various parts of the Province were present.

The report of the Council was read and adopted; also that of the Secretary-Treasurer, which showed a satisfactory state of the finances. The President then delivered his annual address,* for which he received the thanks of the members present.

The election of officers was then proceeded with, which resulted as follows:—

President—Wm. Saunders, London.

Vice-President—Rev. C. J. S. Bethune, M. A., Port Hope.

* See page 189 in present number.

Secretary-Treasurer—E. B. Reed, London.

Librarian—W. E. Saunders, London.

Council—J. A. Moffat, Hamilton; James Fletcher, Ottawa; R. V. Rogers, Kingston; G. J. Bowles, Montreal; J. M. Denton, London; W. H. Harrington, Ottawa, and Wm. Couper, Montreal.

Editor—Wm. Saunders.

Editing Committee—Rev. C. J. S. Bethune, E. B. Reed, J. M. Denton.

Auditors—Chas. Chapman, A. Puddicombe.

After the routine business was concluded, Mr. Bethune offered some remarks on the moth of the cotton worm, *Aletia argillacea*. Twelve years ago he found it extremely abundant late in the season on ripe plums; he had not taken the insect again until this autumn, when they were found to be quite common in his garden. The opinion which had been advanced by Prof. Riley, of Washington, that the examples of the moth taken in these northern sections had flown northward from their breeding places in the south, he did not concur in, but believed that the insect must feed on some malvaceous plant in our midst, since the specimens he had captured were very perfect and looked as if they had just escaped from the chrysalis. He referred to the fact of this insect having been found common in many of the Northern States, as well as in Canada.

Mr. Reed stated that he had taken this insect also in London.

Mr. Moffat exhibited a number of interesting insects which had been captured by him at Long Point and at Ridgeway, among others *Papilio cresphontes*, *P. marcellus*, *P. philenor*, *Darapsa versicolor* and *Funonia cænia*.

Mr. Denton reported the capture of *F. cænia* and *Libythea Bachmani* at Port Stanley; also of *Thyreus Abbotii* at London.

Mr. Moffat stated that this beautiful Sphinx, *T. Abbotii*, had been comparatively common in Hamilton, and that a number of the larvæ had been reared.

Mr. Fletcher reported having captured two specimens of *Erebus odora* at Ottawa, one of them so perfect that he thought it was impossible that it could have flown for any distance, and thinks it must have bred in the neighborhood.

Mr. Saunders referred to several other instances of the capture of this rare moth in Canada during the past few years.

Mr. Fletcher referred to the fact that during the last year there were published a number of papers on popular Entomology, and he hoped to

see them continued, as he believed they were doing good service in making our valuable monthly journal more popular. Several of the members present promised to prepare papers of this character during the coming year.

Mr. Young, of Hamilton, asked for information on the best manner of preserving caterpillars, and enquired if any of the members had any experience in blowing them.

Mr. Reed stated that he had tried and failed. Mr. Fletcher had the same experience to relate, and had found that the only satisfactory method was to draw and color them from nature.

Mr. Fletcher thought that most of our collections were deficient in specimens illustrating nature; that while we had spread specimens, we should also have them as at rest, and where possible, the larvæ, chrysalids and eggs.

Mr. Reed asked in reference to *Anisota rubicunda*, which he had found common on maple about London, but very hard to rear; he wished to know the experience of other collectors. Several of the members present stated that they also had found it difficult to rear them.

Mr. Young had reared a brood of them from butternut and beech, and found them to prefer beech to any other food. Mr. Bethune had also found them on beech trees.

Mr. Fletcher had found a small fly attacking beans this year; the larva had eaten the stem of the bean and bored into the root, and finally produced a small fly somewhat resembling a house fly.

Mr. Saunders had found several years ago a very similar fly, probably the same species, attacking the stems and roots of young cabbage plants. On comparing the fly with the description given in Curtis' Farm Insects of the root-eating fly, *Anthomyia radicum*, often so troublesome in Europe, he thought it probable that it was the same species. Mr. S. also reported the capture of *P. cresphontes* very early in spring, finding the larva nearly full grown in June, which became a chrysalis, and from which the perfect insect escaped in about a fortnight. He had also taken the full-grown larva late in the fall, which had passed the winter in the chrysalis state, from which facts he drew the inference that this species is double-brooded in Canada.

Mr. Fletcher reported having found the larva of *Ceratonia quadricornis* about Ottawa, and finds it a difficult insect to rear.

Mr. Young had fed a brood of the larvæ of *Telega polyphemus* on black birch, on which they seemed to thrive remarkably well.

Mr. Kyle, of Dundas, stated that he had found *polyphemus* feeding on witch hazel (*Hamamelis virginica*), and *promethea* feeding on ash and lilac.

Mr. Moffat had found *promethea* also on wild cherry, as well as on ash, sassafras and lilac.

NEW SPECIES OF N. AM. MOTHS.

BY A. R. GROTE.

Trochilium lustrans, n. s.

Larger than *tipuliformis*, with long black antennae, which are whitish before the tips. Abdomen black with six yellow bands, the two terminal ones broader than the rest and continued beneath. Anal tuft black and yellow. Legs yellow, marked on tibiae and femora with black. Thorax black with yellow inner edge to the tegulae. Head black with a yellow ring behind and yellowish stripe on each side of the clypeus. Palpi yellow. Thorax yellowish beneath. Wings pellucid; primaries with black bar and black fringes and terminal border; beneath the costa of primaries to the transverse bar is yellow; costa of secondaries yellow. *Expanse* 23 mil. Length of body 12 mil. Dayton, O., Mr. G. R. Pilate. Seems to differ from any of the yellow and black species by the white portion of the antennae.

Euhalisidota longa, n. s.

♂ ♀. Size of *E. fasciata* from Cuba, but without the band on ♂ secondaries. Differs from *luxa* by its slighter build, undotted thorax, a dark streak on primaries at extremity of median vein following along vein 5. Yellowish clay color, somewhat dusky about thorax and head. Fore tibiae orange shaded inwardly. Fore wings irrorate with brown speckles. A subterminal row of interspaceal brown dots preceded on the interspace above vein 5 by a brown mark. Vein 5 at base shaded with purple brown. Hind wings immaculate; a brown dot at apices beneath. Length of primary 25 mil. Enterprise, Fla., Mr. Schwarz; Fla., Mr. Drury. I have alluded to this species in Can. Ent. as allied to the forms described by me in 1865 from Cuba.

Mamestra acutipennis, n. s.

This is a species with rather long wings, having the external margin quite oblique. It is nearer, perhaps, to *vicina* than any other species. The wings are blackish gray and with the median space shaded with black. The markings and lines are inconspicuous. The median lines approach on submedian fold. The orbicular is ovate, oblique, paler gray, with black central streak. Reniform similar, upright, rather narrow and small. Subterminal line pale, with a projection over m. nervules, without teeth; it forms the usual more prominent white mark relieved by black scales above internal angle. Secondaries diaphanous white at base with discal point and broad diffuse blackish borders. Thorax blackish. A black line on collar. Beneath the hind wings are whitish at base, powdered with blackish exteriorly, with a discal dot and mesial line. *Exp.* 30 mil. Nevada, Dr. Bailey.

Hadena cylindrica, n. s.

A small bodied and rather large winged species of a dusty gray, with obliterate lines. The orbicular pale gray, rather large, slightly oblique. The reniform large, blackish gray, with blackish centre, relieved by blackish shading. Subterminal line pale, indeterminate, straighter than usual, preceded by a brownish shading over the median nervules. Veins marked in blackish, dotted with white in place of posterior line or behind it. A fine, black, interrupted terminal line. Fringes gray, narrowly cut with paler, and finely interlined. Hind wings yellowish gray, unicolorous, paler beneath, from whence they reflect a mesial line and dot. Fringes whitish; beneath preceded by a black broken line. On primaries above the s. t. line issues from an ill-defined pale apical shading. Thorax like fore wings; abdomen colored like hind wings. Eyes naked. Abdomen without tufts except at base. Tibiæ unarmed. *Expanse* 25 mil. Nevada, Dr. Bailey.

Hadena tonsa, n. s.

A small blackish gray species resembling somewhat the *vicina* group of *Mamestra*, but with naked eyes, and with the subterminal line forming three curves, the widest over the median nervules at the place of the usual W-mark, which latter is usually more prominent in *Mamestra* than in *Hadena*. The median lines uneven, propinquitous, narrowing the median space, especially inferiorly, and shaded with black from the diffuse median shade. Reniform well-sized with double black annulus enclosing a white

ring; the centre gray, or whitish with a mixture of blackish scales. Orbicular well-sized, ovate, a little oblique; colored like the reniform. The narrow terminal space blackish gray. Edge of the wing with an uneven black shaded line. Hind wings fuscous, without markings, with pale interlined fringes. Head and thorax blackish gray; collar with black line. Abdomen with moderate mesial tufts. Beneath the wings are blackish fuscous, with a dot on secondaries and obsolete lines. *Exp.* 22 mil. Nevada, Dr. Bailey.

Hadena (Pseudanarta) crocea Hy. Edw.

This form only differs from the typical *flava* from British Columbia by the primaries above being shaded with pale, especially on the disc, and being more yellowish beneath at base, contrasting with the black border. These colorational characters do not seem to be constant, for in one specimen from Oregon the pale shading is confined to a space about the reniform, and in a still paler *crocea* from Colorado the contrast between the yellow base and the black terminal band is not as great as usual. I think *crocea* is a variety of *flava*. In both the exterior line is outwardly bent over the median nervules and followed by a whitish and then a brown shade.

Hadena (Pseudanarta) singula, n. s.

♂. The primaries have the exterior line not so roundedly exerted over the median nervules and not followed by a white or brown shade. It forms a short tooth opposite the cell. The double black dash on s. t. line opposite the cell is distinct and long. Beneath as in *flavidens*, but differing from this in the wider median space and the prominent flexures of the anterior line inferiorly. The terminal black band on the yellow secondaries above wider than in the other forms. Collected by Belfrage in Texas and considered a variety of *flava* by Mr. Morrison.

Perigea falsa, n. s.

♂ ♀. Eyes naked; tibiae unarmed. Color and appearance of *Mamestra arietis* or *pallilis*, but a little more dusky and yellowish. The color is gray with a mixture of yellowish and fuscous scales. All the markings and lines broken. Stigmata concolorous, with broken black annuli, large, inconspicuous. Posterior line a succession of white venular dots more or less evident, preceded by black dots persistent. Subterminal line uneven, indicated by the difference between the fuscous shaded s. t.

space and the paler yellowish gray terminal space. A broken black terminal line; fringes yellowish gray. Hind wings fuscous in female and with whitish bases in the male. Varies in the amount of fuscous shadings on the primaries. Head and thorax yellowish fuscous. Beneath the wings are light fuscous with faint double lines and spot on secondaries. *Exp.* 28 mil. Havilah, Calif., Mr. Hy. Edwards, No. 6888.

Perigea albolabes, n. s.

Fore wings uniform glistening blackish fuscous with all the lines obsolete except the subterminal, which is represented by a row of white dots, relieved by black scales. The seven white dots on the costa evident. A white spot in the place of the reniform on median vein. The fuscous fringes interrupted with dots alternating with the spots of the subterminal line. Hind wings fuscous with soiled veins and paler bases. Beneath the narrow terminal spaces on both wings gray, lighter and contrasting. On hind wings double lines, the inner dentate, a discal spot. Fore wings with double lines, the outer formed by contrast of color with the pale terminal space; no discal spot. Thorax concolorous with primaries. The reniform above the white spot on fore wings can be faintly perceived marked by detached black and white marks. *Expanse* 34 mil. Prescott, Arizona, Mr. Hy. Edwards.

Lithophane contenta, n. s.

♂. Antennæ more lengthily bi-ciliate than in the other species. Very different from the two previously described Californian species, *oregonensis*, which is like *georgii*, and *carbonaria*, a decidedly aberrant form, both of which I have seen in Mr. Hy. Edwards' collection. The new form is narrow-winged, soiled gray, and resembles *petulca* in its ornamentation, but without the brown colors. All the lines obliterate; the anterior indicated by dots and streaks, strongly dentate. The reniform can be made out, with a brown tinge. The subterminal line shows two black preceding luneiform marks opposite the cell. Hind wings translucent fuscous; beneath with discal dot and extra mesial line indented opposite the cell. The wings are reddish gray below, slightly irrorate with fuscous, faintly colored; the primaries with discal dot and fuscous from the base to s. t. line. Collar brownish with marginal black line; thorax like fore wings. The median shade, angulated on disc, is noticeable on the primaries, on which all the lines and markings are broken and dotted. *Exp.* 38 mil. Calif., No. 4588, Mr. Hy. Edwards.

Cleophana antipoda.

This species has the discal marks evident. It is allied to *eulepis*, but decidedly distinct, having more of the appearance of a *Cucullia*. Fore legs with a tibial claw. Collar with a mesial projection. Fore wings whitish gray with all the lines broken into blackish streaks and points. Hind wings pellucid white with soiled edges and veins. Abdomen with reduced tufts on basal segments. Colorado, Mr. Neumoegen. This species, which looks like *Cucullia asteroides*, but without the brown tints, expands nearly 40 mil., and is, I am informed, the *Cucullia antipoda* of Mr. Strecker.

Mr. Strecker's generic determinations are based throughout on superficial resemblances. No structural details are given except in the case of a genus which he bases on a "very large number" of costal nervules. As the number of these nervules is invariable, never being more than three subcostal and three costal, the value of such an observation is apparent. Not content with establishing species and genera without ever having any experience with structure, Mr. Strecker also makes a disproportionate number of synonyms, not only of small or inconspicuous species, but large and easily known ones, such as *Catocala illecta* and *Smerinthus occidentalis*. Add to this that his publications have been proven to be incorrectly dated, and enough has been shown to justify their neglect at the hands of all right thinking students in the country. In the Noctuidæ I adopt his names where I can find them, but his descriptions are too indefinite to be used where they are not accompanied by figures.

Nolaphana labecula, n. s.

This species, of which I have only females from Wisconsin and New York, is quickly to be separated from *Zelleri* and *malana* by the round orbicular being yellowish white, and the disc beyond it and the place of the reniform are shaded with this same color. The most prominent line is the median shade, which crosses the wing obliquely over the yellowish white shading on the cell and there joins a black streak over vein 5 at base, lined above with pale. The anterior line is roundedly exerted superiorly and not indented here as in its allies. The posterior line is denticulate superiorly where it is even in *Zelleri*, but this line is otherwise much as in *Zelleri*, and not with the prominent indentations of *malana*. In color the new species is more bluish gray, lighter, not so fuscous tinted

as its allies. Beneath it is light yellowish gray with the spots and lines much as in *Zelleri*, which it exceeds in expanse. *Expanse* 22 mil. Erie Co., N. Y. (coll. m.)

Phoxopteris loricana, n. s.

Bronzy brown with metallic reflection. Fore wings produced at apices; a metallic patch, widening outwardly, triangulate, extending to middle of wing, limited inferiorly by the submedian fold. A metallic stripe along internal margin. Costa from middle to apices shaded with ochre brown, enclosing black marks on the edge of the wing and some metallic scales just beyond middle of wing; beyond this is a curved line of black and metallic scales just before apices, and within it some metallic scales on costa. A sinuate black line, becoming metallic at base of fringes, runs down from apices, bounding the ochre brown portion of the wing and limiting outwardly a patch extending above internal angle to middle of external margin. This patch is outwardly ochre brown, enclosing an inferior black dash and above a dead brown ovate spot. Inwardly the patch is metallic, enclosing a black spot and an irregular black line, partially resolved into dashes. Hind wings dark brown with paler fringes. Head and thorax metallic. Beneath iridescent black with ochrey tips to fore wings. *Expanse* 18 mil. Collected by Mr. G. R. Pilate at Dayton, Ohio. Type in collection of Prof. Fernald, who kindly informs me the species is hitherto unnamed.

Racheospila cupedinaria, n. s.

♂. Antennæ with long pectinations, but simple at tips for over one-fourth of their length. Size small. Fore wings delicate green, with the lines obliterate. Red discal points on both wings. Wings margined with dark red and with paler red fringes. Costa of primaries margined with red above and below. On external margin the red edging broadens at internal angle. Internal margin of primaries and costal margin of hind wings without edging. On secondaries the red edging is continued around anal angle, where it widens slightly, as also below apical angle; beneath as above, the discal points feebly marked. Stem of antennæ white above and between them on vertex. Head behind collar and front red. Abdomen red, with white spots on dorsum, the largest near the base; beneath paler. Thorax red centrally with a white spot behind; tegulae green. Length of primary 7 m.m. Florida (Enterprise, May 24), Mr. Schwarz. Differs from *micularia* by the red abdomen and absence of white lining

to the marginal band ; from *lixaria* by smaller size and want of median line, and by having the fringe not spotted with white.

Drepanodes Fernaldi Grote, C. E., x., 17.

I find that this is the same as *Lozogramma atropunctata* Pack., and that I was wrong in referring the moth to *Drepanodes*.

Polia theodori.

Apatela theodori Grote, Can. Ent., x., 237.

This species is of large size and showily stained with pale red. It is grayish white and in its ornamentation closely follows *Polia aedon* Grote and *P. epichysis*. The three forms are related ; the subterminal line is acutely dentate and very obvious, and there is a guttate mesial line on the secondaries. *Aedon* is gray, *theodori* pale red over whitish, *epichysis* is purplish and darker than the others. All three forms are Western and may form a distinct group when both sexes can be thoroughly examined.

Polia epichysis, n. s.

In color and appearance the species copies *Lithophane thaxteri*. Purple gray ; markings distinct. Reniform diffuse, reddish, vague. Orbicular moderate, round, reddish, faintly-ringed. Anterior line outwardly oblique, black, uneven, inflected on vein 1. Half-line marked. Median shade marked on costa. Posterior line dentate, well removed outwardly. Subterminal space paler. S. t. line acutely dentate, followed by blackish shading. Secondaries pale ruddy fuscous. A mesial dotted line and faint discal lunule repeated beneath, where there is a basal ray. Beneath pale, with a ruddy tinge. Thorax purple gray. One fresh specimen, Mr. Behrens, Shasta, Soda Springs.

This species expands 48 mil. ; in ornamentation it closely resembles *theodori*, while very different in color.

Chytolita petrealis, n. s.

♂ ♀. This species has the same ornamentation as *C. morbidalis*, but is darker colored and very much smaller. Dusky olivaceous. Subterminal line guttiform, usually followed by pale points. Median lines a little uneven. Reniform darker than the wing, more or less completely filled in ; in one specimen, a variety, black and contrasting. A terminal broken line. Fringes concolorous. Hind wings paler with an uneven oblique exterior line more or less accentuated, followed by pale shading

and more apparent inferiorly where it is bent before anal angle; the interior line more or less marked. The male palpi seem proportionally longer and held more horizontally than in *morbidalis*. *Expanse* 17 mil. Ohio, Illinois, four examples taken in June and July. In this species the fore legs have the usual pale tuft of hair.

Salia interpuncta Grote.

This species has a wide range. I have it from Florida (Mr. Schwarz) and Mass. (Mr. Goodell). Prof. Zeller had it from Texas; I have taken it originally in Alabama. It is a pretty species.

Biston virginarius, n. s.

♀. Cinereous; white speckled over black. Lines thick, black, continuous. Anterior line upright, flexed below median vein. Median shade as broad as the lines, upright, flexed below median vein, where it runs near to the outer line; this latter is much inwardly bent below median vein, and is less oblique and further from the outer margin than usual. A curved line marks the outer discal spot on the cell and a black dot the inner discal spot between the median shade and the anterior line. Sub-terminal line thick, black, jagged, followed by a white shading. Fringes black, interrupted with white. Veins marked with black. Beneath four equidistant black spots on costa mark the inception of the transverse lines. Secondaries with discal mark and double mesial black lines. Size of *ursarius*, with the wings less translucent, the markings more distinct, the outer line more bent. Shasta, Soda Springs, July, Mr. Behrens.

OBITUARY.

Professor Samuel Stehman Haldeman, of the University of Pennsylvania, a distinguished naturalist and philologist, and at one time President of the American Philological Association, died on Tuesday evening, September 10th, at his residence in Chickis, near Columbia, Pa., aged 68 years.

Prof. Haldeman has long been noted also for his devotion to Entomology. He attended the late meetings of the Entomological Sub-section of the American Association for the Advancement of Science, at Boston, in August, and took an active part in the discussions. At that time he seemed to be in good health and spirits. By his genial disposition and open generous bearing he has endeared himself to a large circle of friends, who will sincerely mourn his loss.

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